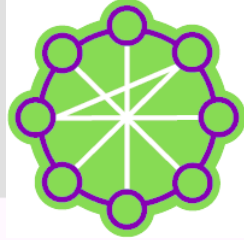
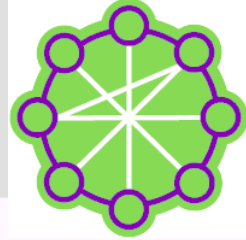


Context Tracking Working Group

Augmented Cognition Workshop

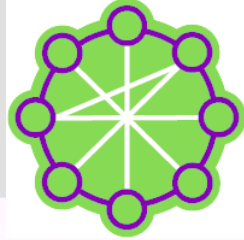
June 14, 2001

What is Contextual Information?



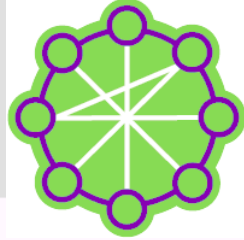
- Information relevant to one's actions
- Information about a situation useful for computers to determine how to act:
  - turning on the lights, lowering TV volume
  - displaying relevant information
- Sometimes these two types of contextual information are the same.
- Yet, there's a subtle meaning of context that suggests
- "Context" implies
  - situational variability
  - information about people, places, information-artifacts, devices, tasks, goals

What is Context?



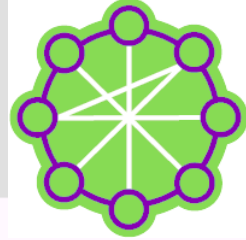
- Context is or should be layered
  - Primitive facts about context
  - Artifacts richly carry context
  - Task models & frameworks for thinking
  - Problems and goals
  - Individuals and groups

Three main points



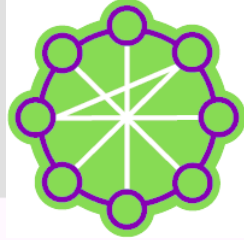
1. **Create an information architecture for representing context**
   - Primitive (and simple) units of information
   - "Deep" knowledge of context occurs through layering.
2. **Solving the hard problems**
   - A little context goes a long way
   - Let the solutions evolve out of an information architecture for context
   - Pay attention to the artifacts the user creates directly or indirectly.
3. **Research communities**
   - Bring on: MultiModal, User modeling (AI/HCI), Cognitive Task Analysis (in a computational form)
   - Learn from: Computational Linguistics, Intelligent Tutoring Systems

Starting Point: Context Tracking



A. Modeling context
   - What is a “model” of context?
   - How do we create one dynamically?
B. Monitor users tasks and infer what they are doing from context
C. Responsiveness to context to support user

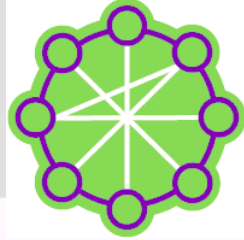
The Context Machine



The Great Context Repository & mechanisms

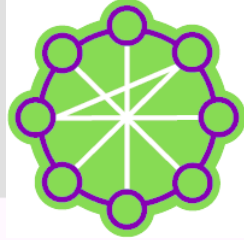
- **Baseline: Human-driven "Knowledge Warrior"**
- **Collects and serves contextually relevant information**
- **Measures of Performance & Effectiveness**
  - **Anticipation Ratio**
  - **Relevance Ratio**
  - **Effort Ratio**

Current Context Success



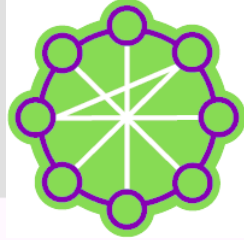
- TiVo
  - Low effort direction
  - Anticipatory heuristic choices
- Amazon
  - User profiling for relevance, low effort
- Auto Navigation
  - Location, location, location
  - Autocorrection and saved routes
- Google
  - Anticipatory heuristic search
  - Adaptation based on information space and usage

Research Areas



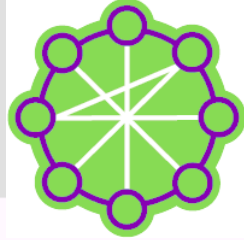
- **Sensing Problems**
  - Collect context-relevant facts about environment
- **Analysis Problems**
  - model tasks / people / environment to interpret context
- **Action Problems**
  - act on analysis to augment cognition of warfighter (present info, manage people's tasks, perform tasks)

Sensing Problem



- **Sensing Individual**
  - **physiology**
  - **tasks**
  - **goals**
  - **preferences**
  - **environment**
  - **information individual creates (thoughts)**
  - **Individual's decision-making framework**

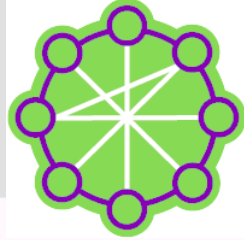
Research Problems



Develop approaches

- **to representing sensory information, symbolic representations of context, and mechanisms to map one to the other.**
- **a single representation and storage approach to treat all this contextual information equally**
- **to maintaining disconnected and/or disparate contexts and yet reconcile them when connected**

Research Problems

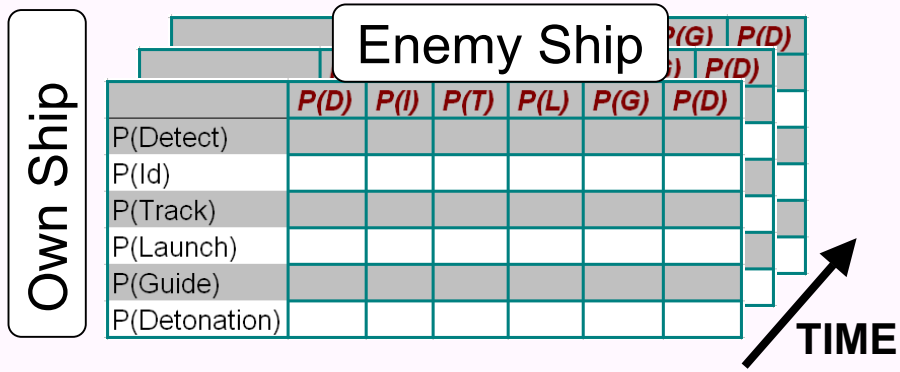


Develop approaches to:

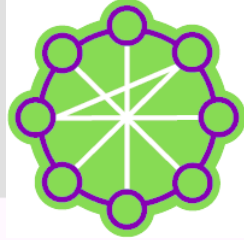
- **How do we visually represent contextual information for use by people?**

Engagement Matrix

- **Framework for representing engagement context**
- **Models Sensory Problem Environment**
  - uses association and probability
  - Models own problem environment
  - Models enemy problem environment
- **Presentation of context state in a matrix**



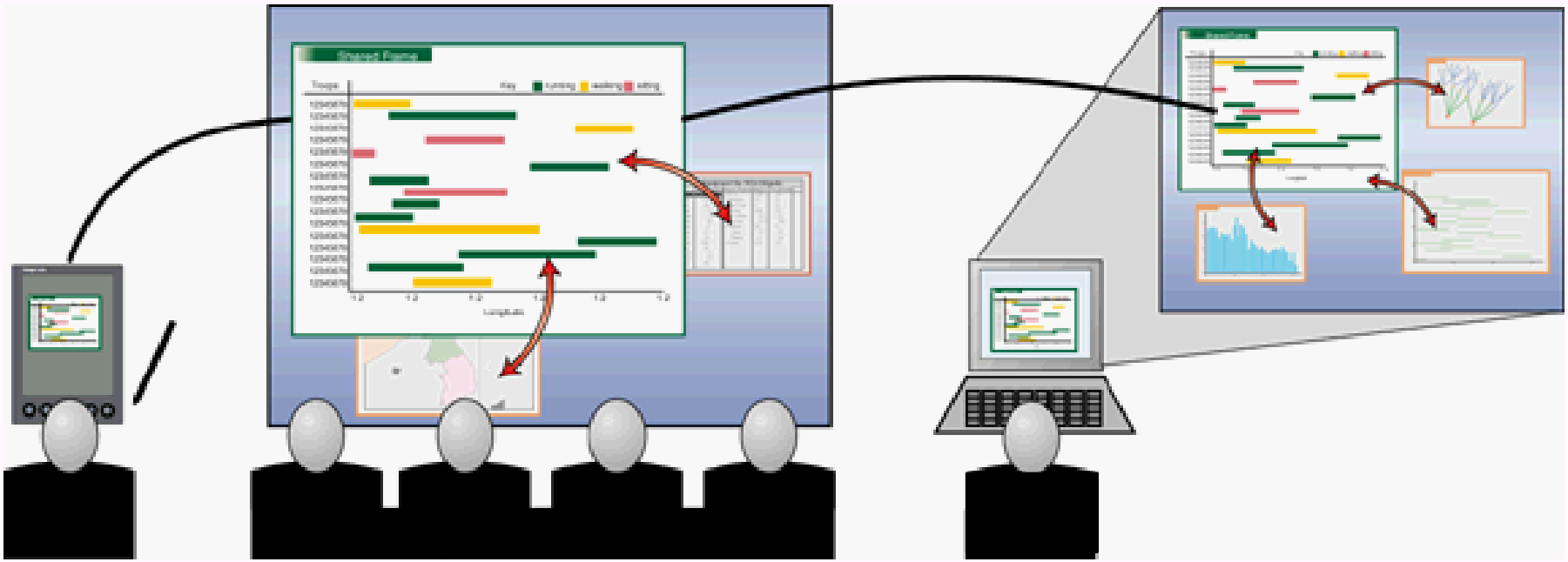
Sensing Problem



- **Sensing Group**
  - **group dynamics**
  - **group goals**
  - **communication among group members**

Shared Frames

- Shared domain of discourse
- Real-time two-way information sharing
- Coordination of public and private views

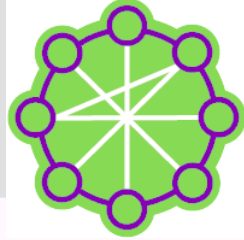



20:51 - Cdr
MAP View
Fire Edt
SLT View
SLT List
Unit Edt
Unit Plt
Table
MAP - SAO
MAP - Bn 1
MAP - F Co
MAP - Bn 3
Unit Editor
Activity
Echelon
Orientation
Affiliation
Type
Name
Equipment
Salute Report Viewer
To
Sensors
Orientation
Echelon
Type
Activity
Time
Equipment
Comments
SHOW INK
Units
Events
Bde
Bn
Co
Plt
Cdr
SAO
Bn 1
F Co
Bn 3
J-STARS
SUPERIOR VALLEY
PILOT KNOB VALLEY
SEARLES MINES
FT. IRWIN
LONG VALLEY

Sensing Problem

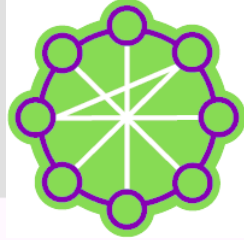
- **Sensing Problem Environment**
  - **Higher level**
  - **Meteorology**
  - **Databases of events, reports, encyclopedic information (e.g. port specs)**
  - **Battle events, histories, plans**

Analysis Problem



- Heuristics for interpreting context
- Cognitive Task Analysis
- Encoding/Modeling characteristics of
  - adversary
  - individual
  - modeling group
  - modeling expert
  - modeling problem environment
  - physiological model

Action Problem



"Take advantage of context mapping algorithms to assist decision-makers in making better quality decisions faster, develop methods and algorithms that function as real-time automated Radar O'Reilly's"

Research problems

- Automated/interactive presentation
  - When to present information to keep context
  - How to present information in context based on cognitive principles
  - Channel selection based on cognitive principles
- Managing Workflows
  - Communicating to others
  - Allocating Resources
  - Tracking workflow progress